TABLE 10. OPTION III: BUDGET CONSTRAINED PROGRAM--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992 (Dollar Amounts in Fiscal Year 1983 Dollars)

Current Force (End of 1981)	535
Retirements Through 1996	240
Now Building or Authorized	98
New Authority Through 1992	146
Fleet Total, 1996	539

Ten-Year Program: 146 Ships Costing $98 billion

Average Annual Program: 14.6 ships costing $9.7 billion

Average Annual SCN a/ Requirement: $12.1 billion

a/ Shipbuilding and Conversion, Navy. It is assumed that new construction accounts for 80% of the SCN appropriation.

TABLE 11. OPTION III: BUDGET CONSTRAINED PROGRAM--ILLUSTRATIVE SHIPBUILDING PROGRAM

Ship Type	Number of Ships	Percent of Total Cost
Trident Submarines	10	14
Aircraft Carriers	0	0
Surface Combatants	62	57
Attack Submarines	6	4
Amphibious Ships	16	11
Minewarfare Ships	24	2
Replenishment Ships	20	7
Material Support Ships	8	4
Fleet Support Ships	0	0
Total	146	

past decade. The relatively low force levels would primarily occur because of the very high cost of the types of ships, now being procured by the Navy, particularly the combatants. Although this option would result in force levels considerably below the Navy's current plans, it would require that recent SCN budget levels be not only maintained but be increased to a level about 25 percent higher on average, in the future.

This option would retain the Administration's recent initiative for reactivating the four Iowa-class battleships. Four surface action groups formed around these impressive ships could be used to supplement the present 12 carrier battle groups in maintaining deployment commitments around the world. Instead of deploying two aircraft carrier battle groups in the Indian Ocean, for example, one carrier group and one surface action group might be deployed there. When upgraded with cruise missiles and improved helicopter-V/STOL aviation capability, a U.S. battleship surface action group would probably be superior to any current Soviet battle group. Use of the battleships in this way could relieve some of the operating pressures on U.S. carrier forces.

Clearly an option that provides higher force levels, but without the very high budget requirements of Options I and II, would be desirable. This alternative is discussed in Option IV.

OPTION IV: EXPANDED NAVY OF MODIFIED FORCE MIX

Option IV investigates the feasibility of achieving higher ship force levels at a lower cost by altering the mix of ships procured. The shipbuilding program of Option IV resembles that of Option II, except that several alternative warship types would be substituted for those currently planned by the Navy. This would result in force levels very close to the goals established by the Navy, but at an average annual SCN budget estimated at about $15.1 billion (in fiscal year 1983 dollars), compared to $24.8 billion for Option I and $21.3 billion for Option II. Shipbuilding budgets of this magnitude, though significantly higher than in the past, might be achievable--if the Administration's plans for substantial real growth in defense spending are realized.

Alternative Ship Types

In seeking ways to reduce shipbuilding program costs, attention is immediately drawn to the surface combatants, since that

category accounts for more than half of the total program costs in each of the three previous options. One of the most significant items in the surface combatant category is the guided missile destroyer (DDG). A large number of this type of ship is needed to provide modern air defense protection to the fleet and to replace the many existing DDGs that will be retired by 1996. The Navy is currently designing a ship, designated DDG-51 (previously DDGX), to fill this role. The DDG-51 would be a capable anti-air warfare (AAW) ship, but its cost has risen steadily during design development and is now estimated at about $800 million per ship. The previous three options all assumed procurement of DDG-51 for the guided missile destroyer role.

In Option IV, it is assumed that the DDGY, a substantially less expensive guided missile destroyer, costing about $400 million per ship, would be procured. 6/ The cost estimate for this ship is based upon the cost for the FFG-7-class guided missile frigate now being built, with additions for upgraded combat system and ship performance features. The DDGY would not have a powerful AEGIS or AEGIS-derivative phased-array radar as does the DDG-51, but it would have a modern AAW missile fire control system incorporating an advanced technology terminal engagement radar (TER). This and other features described in the CBO report cited in footnote 6 would make the DDGY a very capable warship. There is no current program to develop a ship of this kind, however. Such a program would, of course, involve some technical risks and as much as $300 million in research and development (R&D) expenditures. Availability of a ship like DDGY could substantially reduce long-term shipbuilding program costs for surface combatants.

In Option IV aircraft carriers would be procured at the rate of one every three years, as opposed to one every other year in Options I and II. This would place 14 deployable carriers in the fleet in 1996 rather than 15. Fleet aviation capability is supplemented in this option, however, by building twelve cruisers (CGV) with extensive facilities for supporting V/STOL aircraft. These cruisers would operate with surface action groups and underway replenishment groups, as well as in other areas in which carrier-based aircraft are not available.

6/ This ship is discussed in Congressional Budget Office, Naval Surface Combatants in the 1990s: Prospects and Possibilities (April 1981).

Option IV would retain the Navy's new goal of 100 attack submarines but procure updated diesel-electric submarines to provide for the growth from the previous goal of 90 submarines. Though not as effective as nuclear submarines over the full spectrum of missions, diesel-electric submarines can perform quite well in some very important missions, such as barrier patrols. 7/ The most attractive feature of diesel-electric submarines is their low cost in comparison to nuclear-powered ships. Thus, more diesel-electric submarines could be procured for any given investment level. A German shipbuilding firm, Howaldtswerke-Deutsche Werft, has formally offered to design and build a fully equipped diesel-electric submarine of 2,600 tons submerged displacement for the U.S. Navy for $218 million (in fiscal year 1981 dollars). This price includes a capable modern combat system of U.S. manufactured components. The firm estimates that follow-on ships would be about half that price. Nuclear attack submarines funded in fiscal year 1981 cost $457 million each and are estimated to cost $700 million in fiscal year 1983. A mixed force of nuclear and diesel submarines, with nuclear submarines undertaking the more demanding missions, would permit the United States to maintain a force of 100 submarines at lower cost or, alternatively, to maintain a still larger number of submarines at the same cost as an all nuclear force.

Shipbuilding Program

An illustrative shipbuilding program incorporating the force mix changes described above is presented in detail in Appendix D, along with the resulting year-by-year force structure breakdown. The results are summarized in Tables 12 and 13.

Option IV would produce an expanded Navy with force levels comparable to Navy objectives but at a cost substantially lower than Options I and II. It would result in a fleet of 624 ships in 1996, but with the different mix of ships discussed above. The average annual budget requirement of $15.1 billion (in fiscal year 1983 dollars), though less than the $24.8 billion and

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7/ For a further discussion of diesel-electric submarines in modern naval warfare, see Congressional Budget Office, Shaping the General Purpose Navy of the Eighties: Issues for Fiscal Years 1981-1985 (January 1980), pp. 93-96 and Appendix B, pp. 127-40.

TABLE 12. OPTION IV: EXPANDED NAVY OF MODIFIED FORCE MIX--SHIPS IN FLEET BY 1996 AND AUTHORIZED BY 1992 (Dollar amounts in fiscal year 1983 dollars)

Current Force (End of 1981)	535
Retirements Through 1996	240
Now Building or Authorized	98
New Authority Through 1992	231
Fleet Total, 1996	624

Ten-Year Program: 231 ships costing $121 billion

Average Annual Program: 23.1 ships costing $12.1 billion

Average Annual SCN a/ Requirement: $15.1 billion

a/ Shipbuilding and Conversion, Navy. It is assumed that new construction accounts for 80 percent of the SCN appropriation.

TABLE 13. OPTION IV: EXPANDED NAVY OF MODIFIED FORCE MIX--ILLUSTRATIVE SHIPBUILDING PROGRAM

Ship Type	Number of Ships	Percent of Total Cost
Trident Submarines	10	12
Aircraft Carriers	3	9
Surface Combatants	90	42
Attack Submarines	16	5
Amphibious Ships	26	14
Mine Warfare Ships	30	3
Replenishment Ships	38	11
Material Support Ships	13	5
Fleet Support Ships	5	less than 1
Total	231	

$21.3 billion of Options I and II, respectively, is still substantially higher than previous norms. (The fiscal year 1982 SCN authorization was $8.8 billion, or about $9.6 billion in fiscal year 1983 dollars.) Funding the program of Option IV would require substantial real growth in SCN budget authority of about 8 percent per year over the ten-year period. This is clearly more than the 7 percent annual real growth over five years projected by the Administration for overall defense spending, but is less drastic than the budget acceleration required for Options I or II. CBO's analysis, therefore, suggests that budget growth in SCN beyond that projected for defense as a whole will almost certainly be required if any significant naval force expansion is to be realized.

The fleet resulting from Option IV would not be simply a less expensive program than Options I and II. It would also be structured in accordance with a somewhat different view of naval warfare. Although it would possess much better offensive strike capability than today's fleet, the fleet of Option IV would be oriented more toward broad-ocean, distributed-force operations as opposed to concentrated battle group strikes. Although this force would contain 14 large aircraft carriers and the ships to support them, it would be less optimized for offensive strike operations than the forces of the previous options in the interest of obtaining more ships, such as the CGV and the DDGY, that are well-suited to worldwide operations against a distributed threat. This fleet structure would be consistent with the view, described in the preceding chapters, that the ability to control and defend large areas of the ocean is likely to be at least as important a capability for U.S. naval forces in the future as the ability to mount a frontal assault by battle groups in enemy waters.

Four Program Options--Recapitulation and Conclusions

Consideration of the four program options discussed above suggests some important conclusions regarding the Navy's current force expansion plans. Options I and II indicate that expanding to the force levels proposed by the Navy with the kinds of ships currently programmed could not be accomplished without increasing shipbuilding budgets to levels well above previous peacetime budgets and well above levels that would be reached with 7 percent annual real growth. Option III indicates that, if the Navy continued to procure the kinds of ships currently programmed and if shipbuilding budgets did not grow substantially above current levels, the Navy of the 1990s would be essentially that projected by the previous Administration. Attainment of the currently

stated force goals within the bounds of the current Administration's planned real growth in budget authority would be achieved only if successful efforts could be mounted to develop less costly warships, such as those suggested in Option IV.

CHAPTER IV. INDUSTRY AND NAVAL FORCE EXPANSION

Any discussion of a sustained increase in a major defense program, like the naval force expansion, should include consideration of the industrial base necessary to support such a program. This chapter provides a summary description of the industrial conditions relating to warship construction in the United States and an assessment of the feasibility, from an industrial standpoint, of the options presented in Chapter III. 1/

CBO concludes that there is adequate shipbuilding capacity in the United States to support any of the four options considered in this report. In fact, given the present severely depressed commercial ship market and the bleak prospects for near-term improvement, an expanded naval ship construction program might be the best means of preventing a serious deterioration of the industrial base supporting the Navy.

Modern warships, however, are not built by shipyards alone. The shipyards are supported by a host of other contractors who supply everything from raw materials to complex electronic systems. Indeed, in the case of the more complex modern warships, only about 40 percent of the total cost goes to shipyards, with the balance spent to procure the combat system components (missile systems, radars, sonars, and so forth) and for other equipment and program support functions. Problems that could govern ship delivery schedules could also arise in these supporting industries. No such problems are now evident, however, largely because of excess capacity in the economy as a whole. Potential future problems in these supporting industries, while not the focus of this chapter, might be averted by a sustained commitment to higher production rates.

1/ This assessment draws heavily upon the results of a study of the U.S. and Soviet shipbuilding industries prepared by the Department of Defense at the request of the Senate Armed Services Committee. See R.E. Kuenne, et al., The Shipbuilding Industries of the U.S. and U.S.S.R. as Bases for National Maritime Policies: Current Capabilities and Surge Demand Potential, IDA Report R-260 (Arlington, Virginia: Institute for Defense Analyses, February 1981).

THE U.S. SHIPBUILDING INDUSTRY

The U.S. shipbuilding industry enjoys a long and proud tradition dating from early colonial days. It provided the merchant hulls, from clippers to containerships, that carried the waterborne commerce of a maritime nation through two centuries of unparalleled economic growth. American shipyards also produced the warships that protected this commerce and U.S. interests around the world. Now this industry is in trouble. It is widely agreed that the shipbuilding industry (or more precisely that segment producing ocean-going ships) is uneconomic and would almost disappear if it were not for the protection and subsidies it receives as a result of national maritime policy. This is primarily a result of fundamental economic realities, and is a plight shared by the shipbuilding industries in many other industrially mature nations.

The Shipbuilding Process

The shipbuilding process resists the industrial innovations that have been so successful in other industries. Ships cannot be mass-produced because of low unit demand. While automobiles of a given type are produced by the hundreds of thousands and airplanes by the hundreds, it is unusual for production of a given ship design to extend beyond ten units. Ships, therefore, are a tailor-made product, produced by skilled craftsmen without the aid of the labor-saving production-line techniques that higher volume production might justify. This does not mean that the industry has been devoid of technical improvements. Impressive advances have been made, including greatly improved welding methods, numerically controlled cutting and machining techniques, modular construction methods, semiautomatic assembly of piping and structural members, and computer-based control methods, to name only a few. Nevertheless the nature of the product and the inherent low unit volume make shipbuilding a labor-intensive process. This is demonstrated by the low value of shipments per employee relative to other industries shown in Table 14.

Current Status of U.S. Shipyards

Although there are over 400 firms engaged in some aspect of shipbuilding and repair in the United States, most of these are quite small and the private shipyards relevant to naval industrial planning number only about 26. These can be further narrowed to only nine that are currently capable of warship construction. Of the rest, the Navy considers six capable of building amphibious

TABLE 14. REAL VALUE OF SHIPMENTS PER EMPLOYEE, 1972-1976 (In 1976 dollars)

Industry	1972	1973	1974	1975	1976
Shipbuilding	17,302	20,060	24,886	33,270	31,030
Automobiles	94,529	99,237	98,600	126,001	173,333
Aircraft	28,872	34,408	40,754	54,681	60,664

SOURCE: R.E. Kuenne, et al., The Shipbuilding Industries of the U.S. and U.S.S.R. as Bases for National Maritime Policies: Current Capabilities and Surge Demand Potential, IDA Report R-260 (Arlington, Virginia: Institute for Defense Analyses, February 1981), p. S-18.

and auxiliary ships and eleven others capable of building seagoing merchant ships. These are listed in Table 15.

In addition, the Navy itself maintains eight shipyards, four on the east coast, three on the west coast, and one in Hawaii. These are very important to maintaining the fleet as they are all major industrial activities fully capable of dealing with the complexities of modern warships. Although the naval shipyards have built ships throughout most of their long history, since the late 1960s all new ships have been constructed in private shipyards, with the naval shipyards devoting their efforts to overhaul and repair.

Another important distinction among shipyards with regard to Navy support is the capability to work with nuclear reactors. Currently two private shipyards (General Dynamics, Groton, Connecticut, and Newport News Shipbuilding & Drydock Co., Newport News, Virginia) and six naval shipyards (Portsmouth, Norfolk, Charleston, Puget Sound, Mare Island, and Pearl Harbor) are qualified to work on nuclear-powered ships.

This shipbuilding base should be adequate to support any but the most extraordinary industrial support needs of the Navy. The key industrial problem is to keep the U.S. shipbuilding industry from collapsing owing to a lapse in demand for its product. Compared to 1972 and 1973, when new contracts for 48 and

TABLE 15. MAJOR U.S. SHIPBUILDING YARDS, BY REGION, DECEMBER 1980

	Total Plant Employees	Total Production Workers	Building Category a/
Total Active Shipbuilding Base	119,109	98,000	---
Atlantic Coast	66,501	55,687	---
Bath Iron Works	5,584	4,969	I
General Dynamics, Quincy	3,740	2,294	I
General Dynamics, Groton	24,738	21,365	I
Bethlehem Steel, Sparrows Pt.	2,720	1,523	II
Maryland Shipbuilding and Drydock	1,806	1,168	II
Newport News Shipbuilding and Drydock	24,208	18,713	I
Norfolk Shipbuilding and Drydock	3,705	2,513	III
Gulf Coast	28,635	22,819	---
Tampa Ship Repair & Drydock	700	406	III
Alabama Drydock & Shipbuilding	1,249	945	III
Litton/Ingalls, Pascagoula	11,926	9,638	I
Avondale Shipyards	7,723	6,124	I
Halter Marine Services	2,507	2,074	II
Equitable Shipyards	1,110	800	III
Levingston Shipbuilding, Orange	2,237	1,812	III
Todd Shipyards, Houston	489	441	III
Todd Shipyards, Galveston	694	579	III
Pacific Coast	19,681	15,864	---
National Steel & Shipbuilding	7,528	5,837	II
Todd Shipyards, San Pedro	3,789	3,228	I
Bethlehem Steel, San Francisco	580	328	III
Tacoma Boatbuilding Company	2,057	1,533	II
Todd Shipyards, Seattle	4,167	3,607	I
Lockheed Shipbuilding, Seattle	1,560	1,331	I
Great Lakes	4,292	3,630	---
American Ship Building, Lorain	1,096	896	III
Peterson Builders, Inc.	974	884	III
Bay Shipbuilding, Sturgeon	1,358	1,111	III
Marinette Marine Corp.	864	739	II

SOURCE: Department of the Navy, U.S. Maritime Administration, Institute for Defense Analyses.

a/ I = Combat capable (plus amphibious/auxiliary and merchant);
II = Amphibious/auxiliary capable (plus merchant); and
III = Merchant capable (only).

43 merchant ships of 1,000 gross tons and over, respectively, were placed with U.S. shipbuilders, only seven vessels were ordered in 1980 and six in 1981. As of December 31, 1981, the orders for merchant shipbuilding for all U.S. shipyards totaled only 33 ships with a total displacement of 705,000 gross tons. As of the end of 1981, the backlog of 98 Navy vessels and nine Coast Guard vessels, ordered (or to be ordered) by the U.S. government, are now the economic mainstay of the industry.

At the start of the decade of the 1970s, fewer than 40,000 workers in private shipyards were engaged in naval ship construction. As a result of an expanding workload, this force grew to 80,000 by mid-1979. This expansion was attended by many difficulties, including schedule slippages, cost overruns, and a resulting adversary relationship between some shipyards and the Navy. At the end of 1981, the number of workers engaged in naval construction had fallen to about 58,000 and is expected to fall still further to about 45,000 given currently funded work. If given the task of building a larger Navy in the future, the shipbuilding industry would have to expand again and the costs of recruitment and training and other turbulence caused by expansion might be reflected in higher prices for ship construction.

THE OPTIONS--INDUSTRY IMPLICATIONS

The Institute for Defense Analyses (IDA) study cited earlier investigated the capacity of the industry to support a series of 14-year shipbuilding programs resulting in fleet sizes ranging from 500 to 800 ships. Some conclusions of that study can be summarized as follows:

- o 500-Ship Force. Easily supported by existing shipyards, less than half would be provided a viable workload. Attrition of many small and some large yards would be likely.
- o 600-Ship Force. Also easily within the capacity of the existing shipyards. Some shrinkage of the industry would be likely.
- o 700-Ship Force. Begins to tax the capacity of the present industrial base, as limited by labor and components supply factors under peacetime conditions. Some delays would occur because of the limited number of nuclear-qualified yards.

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- o 800-Ship Force. Would press the capacity of all existing private and naval shipyards, particularly with regard to labor and components. Would probably need to expand the number of nuclear-qualified building yards.

The four options in this report were specifically analyzed using the computer model developed by IDA for its study. This model, called IDASAS for Institute for Defense Analyses Ship Allocation System, sequentially allocates the ships of an inputted shipbuilding program to the various shipyards (as governed by the various constraints programmed into the model.) It then calculates, among other things, the number of shipyards required to produce the ships and the total employment levels necessary to carry out the program. The IDASAS results, it should be emphasized, express the full effect of only selected critical factors affecting shipbuilding output, chiefly building positions within the shipyards and labor supply. All IDASAS results, therefore, are really minimum estimates of the number of yards that might be required under normal conditions.

The results of the IDASAS runs for Options I through IV are summarized in Table 16. IDASAS calculates that as few as five to nine shipyards could support the new construction requirements of the four program options considered and that average man-year requirements would not exceed 59,000. A comparison of these results with the resources available (as of December 1980) suggests that adequate shipbuilding capacity is available for any of the four options.

The IDASAS model tries to maximize the utilization of shipyard facilities so as to calculate the minimum number of shipyards required. The number of required yards shown in Table 16, therefore, understates the number that could be supported as economically viable enterprises under the four options. In reality more shipyards, perhaps twice as many, would probably be used to support the building program in any of these options. This would allow for capacity to accommodate the unforeseen delays and interferences that are inevitable in real-life ship construction and would maintain a larger industrial base for surge requirements.

The results of the IDASAS assessment indicate that, given the currently available facilities, the capacity of the industrial base is unlikely to be a constraint for any of the four options considered. The key shipbuilding industry problem at the

TABLE 16. SUMMARY OF RESULTS OF IDASAS CALCULATION OF MINIMUM INDUSTRIAL REQUIREMENTS FOR FOUR OPTIONS

Option	Number of Ships Built	Number of Shipyards Required	Total Man-years Required (In thousands)	Average Annual Man-years Required (In thousands)
I	176	9	355	59
II	230	7	530	53
III	146	5	279	28
IV	231	9	380	38

present time is acquiring adequate work to sustain itself. If such work does not materialize, then there may be a substantial contraction of the shipbuilding industry in the next few years. If that should occur then sufficient industrial capacity to support a naval expansion program could become a problem in the future.

CHAPTER V. OVERALL COST IMPLICATIONS OF NAVAL FORCE EXPANSION

The costs outlined for the four options in Chapter III and explained in more detail in the appendixes are just those funded in the Shipbuilding and Conversion, Navy (SCN) authorization. A buildup of naval force will, of course, lead to additional costs in other budget categories as well. These additional costs are interrelated and spread across a wide spectrum of activities. Calculating them is a complex and laborious process. CBO, however, has developed a computer model called the Defense Resources Model (DRM) that automates much of this process, making possible relatively rapid estimates of the overall budgetary effects of changes in procurement plans. For a more detailed discussion of the methods used to derive the overall budget authority estimates, see Appendix F. For each of the shipbuilding program options considered in this report, the DRM was used to estimate the overall budgetary implications for the Department of the Navy.

In addition, CBO is preparing two companion reports to this paper that specifically examine two other important aspects of the proposed expansion of the Navy. One of these, The Budgetary Implications of Modernizing and Expanding Carrier-Based Air Forces (forthcoming), examines procurement of aircraft for the additional air wings needed to support a larger aircraft carrier force, and the other, Manning the 600-Ship Navy: Requirements Versus Supply (forthcoming), examines the manpower requirements of the Navy under the same four options considered here.

OTHER COST CATEGORIES

Many types of costs would be affected by a Navy buildup. Some major categories are discussed below. In estimating future costs, the Defense Resources Model used cost and other relationships based on the budget approved by the Congress for fiscal year 1982. Cost factors were updated to fiscal year 1983 dollars by adding the amount of overall price growth that CBO expects to occur. Cost increases from factors other than inflation are not included in these estimates.

Aircraft Procurement, Navy (APN)

Growth in the number of aircraft carriers in the Navy would require procurement of aircraft to form additional air wings. Because of the high cost of today's high-performance naval aircraft, this would be a substantial budget item. The aircraft needed to form a new air wing for a new $3.6 billion aircraft carrier would probably cost about $5.6 billion. The $5.6 billion includes the cost of aircraft assigned to carrier squadrons, plus those for training squadrons, the repair pipeline, and advance attrition aircraft for 15 years. The Navy not only plans to expand the number of air wings; it is also modernizing existing wings. Costs of this modernization program are included in the estimates.

All estimates assume the Navy's plan for modernization and expansion of its air forces. Thus costs assume that all carriers, except the Coral Sea and Midway, would be equipped with the F-14 as the fighter/interceptor aircraft; fighter/interceptors protect carriers from enemy bombers and escort attack aircraft. The F/A-18 and the A-6E are the aircraft designated for light and medium attack roles, respectively. Attack aircraft are used to deliver ordnance against land and sea targets. The S-3A is included as the antisubmarine aircraft. 1/ Other, more minor, aviation missions are to be carried out using aircraft types planned by the Navy.

The exact year when these many types of aircraft would be procured does not necessarily reflect the Navy's detailed plans, but rather a reasonable profile coordinated with the time when ships would enter the fleet under the various options in this report. The annual rates of aircraft procurement are consistent with those in recent Department of Defense procurement plans provided to the Congress.

Weapons Procurement, Navy (WPN)

The weapons employed by the Navy's ships and aircraft are procured in the WPN account. This includes the many different types of sophisticated missiles and torpedoes that have become

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1/ The S-3A aircraft is not currently being procured. Costs in this report assume that the production line would be reopened.

the costly cutting edge of modern naval combat systems. It is anticipated that this account will grow in the future, because of a continuation of the trend toward use of sophisticated weapons in naval combat systems and deployment of these weapons as part of the Navy's modernization program. Also, an increase in the number of ships and aircraft, as currently proposed by the Navy, would require increased procurement of weapons to support the larger force. Estimates in this report assume that total purchases of most Navy weapons--including the costly, sophisticated weapons--would expand in rough proportion to the increases in numbers of ships and aircraft.

Operation and Maintenance, Navy (OMN)

The OMN account contains funds to support the many activities necessary to operate and maintain the fleet, including fuel, spare parts, pay for the Navy's civilian employees, and depot repair of ships and aircraft. Clearly, growth in this account can be expected as the number of ships and aircraft in the Navy grows.

Estimates in this report assume that those funds that are directly related to the number of ships or aircraft in service, such as the fuel, spare parts, and maintenance for a particular weapon, are increased in proportion to the increased numbers of ships or aircraft in the fleet requiring these items. The rest of the operation and maintenance account, which cannot be directly related to the number of ships and aircraft, remains at its present level.

The factors used to estimate operation and maintenance funds are based on the 1982 budget, adjusted only for estimated price growth between 1982 and 1983. Thus any policy changes related to operation and maintenance funds, such as those proposed in the 1983 budget to improve readiness, are not reflected in these estimates. Costs for civilian personnel, which are included in the operation and maintenance account, reflect actual and planned pay raises through October 1, 1982.

Military Personnel, Navy (MPN)

The MPN account contains funds to pay the Navy's uniformed personnel. An increase in the Navy's force levels would require an increase in military personnel strength and, therefore, an increase in the military personnel budget. Estimates of

personnel costs reflect numbers of personnel needed to man ships and aircraft, assuming manning levels consistent with the budget for fiscal year 1982. Sufficient personnel are added to the shore establishment to ensure that the percentage of time people spend deployed on ships or aircraft remains at current levels. The costs of these added personnel, both those deployed and those ashore, are estimated based on pay raises through October 1, 1982.

Military personnel costs for Options I, II, and IV could be understated because of potential recruiting and retention problems. Between 1982 and 1987, the projected supply of recruits volunteering for naval service seems adequate to maintain the current quality of new recruits while also meeting numerical requirements. This assumes that pay raises beyond 1982 keep pace with those in the private sector. Beyond 1987, however, recruiting and retention might not be sufficient to meet requirements. The Navy could eliminate recruiting problems by lowering quality standards for entering recruits. Alternatively, the Navy could limit demand for male recruits, who are in short supply, by increasing numbers of female recruits, who are generally not in short supply. Without these or other changes in personnel policies, additional money might be needed for bonuses to keep up needed recruiting and retention levels. 3/ Since the need for these added sums would depend on detailed personnel policies, they were not included in the cost estimates in this report.

The estimates for all the options understate long-run manpower costs because they exclude one major category of personnel costs--funds for military retirement. Under current budget procedures, funds for military retirement appear in the budget only after persons complete their career, which usually takes at least 20 years, and retire. Thus this naval buildup would not increase retirement costs significantly for at least 20 years. On the other hand, the Administration has recommended paying for military retirement on an "accrual" basis. This would require budgeting now for future retirement costs. If this system were in effect, costs for military personnel would increase by about 30 percent over those in this report.

3/ See Congressional Budget Office, Manning the 600-Ship Navy: Requirements Versus Supply (forthcoming).

Other Costs

There are other types of costs that generally do not vary as distinctly with increases in numbers of ships and aircraft. Among these are costs for research and development, military construction, and family housing. These costs are included in the estimates, generally increasing according to recent plans through 1987 but remaining constant thereafter. Budget authority for the Marine Corps, which is included in the budget of the Department of the Navy, is also shown. Marine Corps budget authority remains essentially constant at its current level, although a small portion does vary with the number of ships and aircraft in the fleet.

COSTS OF THE FUTURE NAVY--ESTIMATES FOR THE FOUR OPTIONS

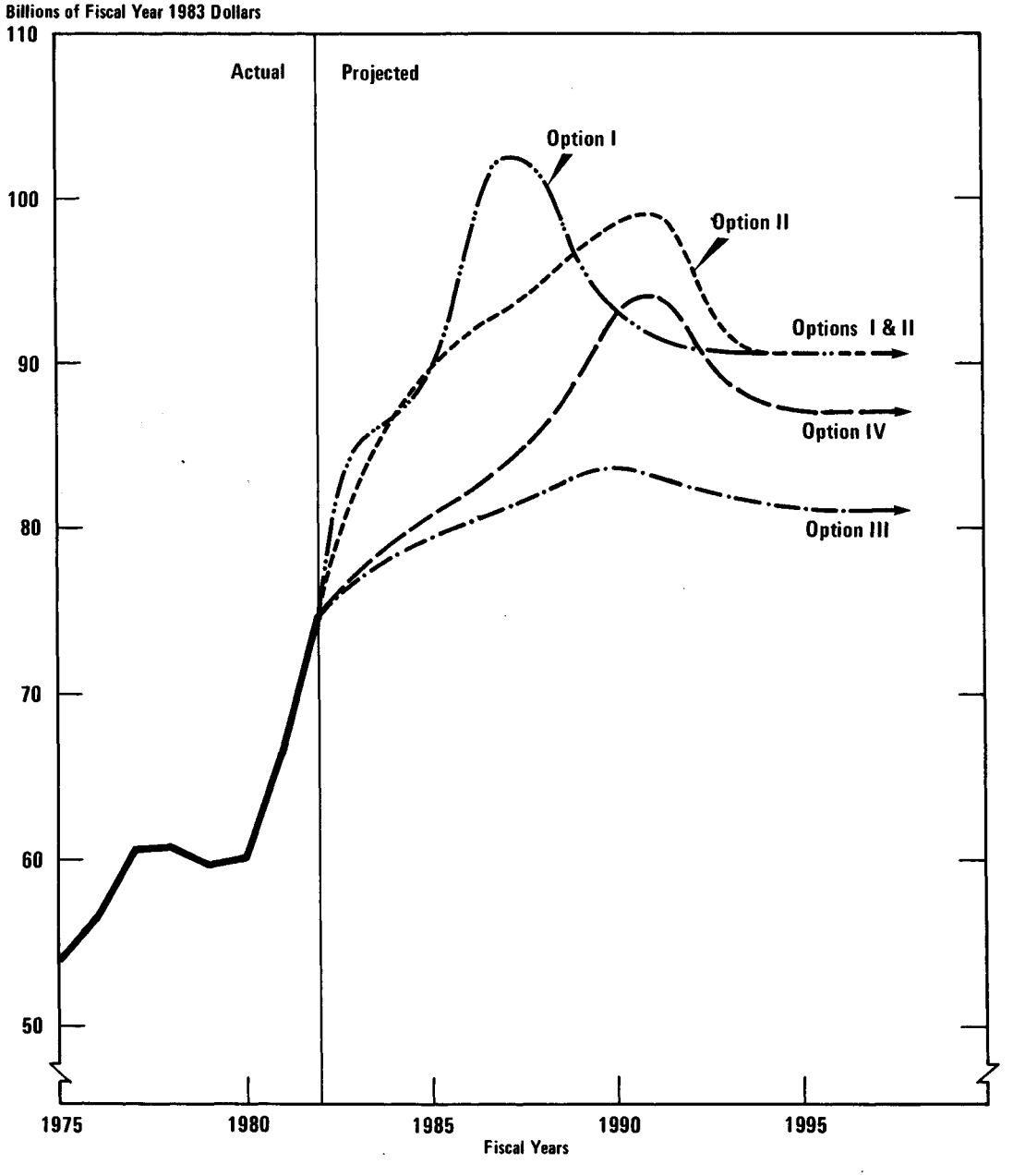
Estimates for the Department of the Navy budget required for each option, in fiscal year 1983 dollars, are shown in Tables 17 through 20, at the end of this chapter. As is the case with most projections, these numbers become increasingly speculative as one moves further into the future. Figure 2 plots these budget projections for the four options, together with recent actual levels of Navy budget authority.

The steepest increases in budget authority would be required for Option I, with Options II, IV, and III having successively lower budget requirements in that order. These projections (data are faired in the later years to illustrate trends more clearly) show budget authority peaking at about $102 billion for Option I and then settling back to a sustaining level of just over $90 billion. Similarly Option II peaks at about $99 billion before settling to a sustaining level of about $90 billion per year. The peak occurs later for Option II than for Option I, because of the accelerated procurement for the force buildup in Option I, but both resolve to about the same sustaining level since both options eventually arrive at the same force goal. Similarly, Option IV experiences a peak at about $94 billion and then resolves to a sustaining budget level of $87 billion.

Budget levels for Option III rise at a slower rate than for the other options and steady at a sustaining rate of about $76 billion. Option III, which resulted in a smaller fleet size than the other options, would have the lowest budget authority requirement.

Figure 2.

Navy Budget Authority Since 1975 and Projected to 1995 Under Four Program Options



The estimates in this report do not include the effects of growth in weapons costs because of factors such as price underestimates or changes in the weapons systems. There could also be price growth in the operation and maintenance account, if readiness improvements were achieved, and in the personnel accounts to reflect real pay growth in the economy. No money is set aside for such increases. While these factors could drive up future Navy budgets, the economy itself would, it is hoped, also grow over this lengthy period. Thus, these added costs might not increase the burden on the economy imposed by Navy spending.

Finally, all these budget projections are stated in terms of fiscal year 1983 dollars. The effects of general economic inflation are not included in the estimates presented. Actual future budgets, stated in terms of future-year dollars, would, of course, be higher than the numbers shown here, as would costs of most other federal and private endeavors.

TABLE 17. OPTION I: ESTIMATED BUDGET AUTHORITY FOR DEPARTMENT OF THE NAVY (By Fiscal Year, in Billions of Fiscal Year 1983 Dollars)

	1982	1983	1984	1985	1986	1987
SCN a/	9.6	19.8	20.8	22.0	26.1	32.5
APN b/	8.1	7.8	7.7	8.3	9.6	9.8
WPN	3.4	3.7	3.5	3.5	3.5	3.8
MPN c/	11.5	11.6	11.7	11.8	12.0	12.2
O&MN	20.1	20.3	20.4	20.6	20.9	21.7
Other BA d/	13.0	13.1	13.0	14.1	14.7	13.2
Subtotal, Navy e/	65.7	76.3	77.1	80.3	86.8	93.2
Subtotal, Marines f/	8.9	8.7	9.4	9.2	9.1	9.0
Total, Department of the Navy	74.6	85.0	86.5	89.5	95.9	102.2

(continued)

a/ Assumes new construction accounts for 80 percent of total SCN budget requirement.

b/ APN for the AV-8B, as well as certain APN which varies with aircraft force levels, are included in Marine related budget authority.

c/ MPN includes military pay raises through October 1, 1982.

TABLE 17. (Continued)

	1988	1989	1990	1991	1992
SCN a/	29.8	13.8	13.8	13.8	13.8
APN b/	10.0	10.9	11.7	11.5	11.2
WPN	5.3	6.8	7.3	7.4	7.4
MPN c/	12.6	13.1	13.5	14.0	14.4
O&MN	21.7	22.4	23.0	23.5	23.9
Other BA d/	13.6	13.9	14.0	14.1	14.2
Subtotal, Navy d/	93.0	80.9	83.3	84.3	84.9
Subtotal, Marines	8.8	8.2	7.8	7.8	7.8
Total, Department of the Navy	101.8	89.1	91.1	92.1	92.7

d/ Includes all remaining fleet budget authority, such as Marine Corps costs generated by Navy force activities, all research, development, test, and evaluation (RDT&E), family housing, and military construction.

e/ Excludes Navy costs generated by Marine Corps activity, such as aircraft personnel, as well as small elements of APN, WPN, and Other BA.

f/ Includes all Marine budget authority except that generated by Navy forces.

TABLE 18. OPTION II: ESTIMATED BUDGET AUTHORITY FOR DEPARTMENT OF THE NAVY (By Fiscal Year, in Billions of Fiscal Year 1983 Dollars)

	1982	1983	1984	1985	1986	1987	1988	1989
SCN a/	9.6	17.1	20.5	22.4	23.1	23.4	21.8	23.1
APN b/	8.1	7.8	7.7	8.3	9.6	9.8	10.0	10.1
WPN	3.4	3.7	3.5	3.7	3.4	3.7	5.2	6.6
MPN c/	11.5	11.6	11.7	11.8	12.0	12.2	12.4	12.7
O&MN	20.1	20.3	20.4	20.6	20.9	21.3	21.6	22.1
Other BA d/	13.0	13.1	12.9	14.0	13.3	13.2	13.5	13.8
Subtotal, Navy e/	65.7	73.6	76.7	80.8	82.3	83.6	84.5	88.4
Subtotal, Marines f/	8.9	8.7	9.4	9.2	9.1	9.0	8.8	8.2
Total, Department of the Navy	74.6	82.3	86.1	90.0	91.4	92.6	93.3	96.6

(continued)

a/ Assumes new construction accounts for 80 percent of total SCN budget requirement.

b/ APN for the AV-8B, as well as certain APN which varies with aircraft force levels, are included in Marine related budget authority.

c/ MPN includes military pay raises through October 1, 1982.